Cisco 12000 Series Gigabit Switch Routers

Description

The Cisco 12000 series Gigabit Switch Routers (GSR) is a new product class of routers that perform Internet routing and switching at gigabit speeds. The Cisco 12012 and Cisco 12008 meet the exponential growth in demand for Internet bandwidth and bring scalability and high-performance services to IP-based networks. Designed to meet current and future Internet traffic requirements, the Cisco 12000 series initially supports IP backbone links at OC-3/STM-1 (155 Mbps) and OC-12/STM-4 (622 Mbps)—facilities up to four times faster than those used today.

The Cisco 12000 series is built around a high-speed switching fabric that provides nonblocking bandwidth to support high-performance IP-based LANs and WANs. The switching fabric is scalable from 15 to 60 Gbps on the Cisco 12012 and from 10 to 40 Gbps on the Cisco 12008. Both the Cisco 120012 and Cisco 12008 support IP over SONET/SDH and ATM interfaces.

The Cisco 12012 has 12 user-configurable slots, and the Cisco 12008 has eight user-configurable slots. These slots contain line cards and Gigabit Route Processor (GRP). Network interfaces reside on line cards that provide connection between the router's switch fabric and the external networks.

For more information on the Cisco 12000 series, refer to the *Cisco 12012 Gigabit Switch Router Installation and Configuration Guide* and the *Cisco 12008 Gigabit Switch Router Installation and Configuration Guide*.

List of Terms

Cisco Express Forwarding (CEF)—An advanced Layer 3 switching technology for IP. CEF optimizes network performance and scalability for networks with large and dynamic traffic patterns, such as those associated with the Internet, Web-based applications, and interactive sessions.

Gigabit Route Processor (GRP)—Serves as the console for the Cisco 12000 series, handles environmental monitoring for the entire system, and provides the line cards with routing table updates.

Line cards—Provide connection between the router and the network and are available in a variety of network media types (based on your order). Line cards communicate with each other and with the GRP through the switch fabric.

Switch fabric—The circuitry that carries the user traffic between line cards or between the GRP and a line card.

Document Conventions

Command descriptions use these conventions:

- **Boldface** indicates commands and keywords that are entered literally as shown.
- *Italics* indicate arguments for which you supply values; in contexts that do not allow italics, arguments are enclosed in angle brackets (>).
- Square brackets ([ ]) indicate optional elements.
- Braces ({ }) group required choices, and vertical bars (|) separate alternative elements.
- Braces and vertical bars within square brackets ([{ | }]) indicate a required choice within an optional element.

Supported MIBs

The Cisco 12000 series supports the following MIBs:

- Cisco Config Man MIB
- Cisco Environmental MIB—The new ciscoEnvMonAlarmContacts MIB object in the Environmental MIB to monitor the alarm contacts on the alarm card (for the Cisco 12012) or the clock and scheduler card (for the Cisco 12008). Alarm contacts are a set of relays that light LEDs or create audible alarms when a condition occurs on the Cisco 12000 series. Conditions are either minor, major, or critical. You can also check the status of another Cisco 12000 series.
- Cisco Flash MIB
- Old Cisco Chassis MIB
- Old Cisco IP MIB

For descriptions of supported MIBs and how to use MIBs, see Cisco's MIB website on CCO at http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml.

The Cisco 12000 series supports the following RFCs:

- RFC1213 - MIB II
- RFC 1619
- RFC 1595—For RFC 1595, we do not support SONET Far End Line Group, SONET Far End Path Group, SONET VT Group, and SONET Far End VT Group.

Configuration Tasks

The following configuration tasks are listed for the Cisco 12000 series because they are in addition to or different from configuration information listed in the Cisco IOS documentation set. All tasks are optional.

- Loading Cisco IOS Images
- Troubleshooting
- Monitoring and Maintaining the Cisco 12000 Series

In addition to the above configuration tasks, also refer to the "Cisco Express Forwarding" feature module for information on how to configure CEF on the Cisco 12000 series.

For information on configuring IP and IP Routing, refer to the "Configuring IP" and "Configuring IP Routing Protocols" chapters in the *Network Protocols Configuration Guide, Part 1*.

For information on configuring the line cards and Gigabit Route Processor, refer to the following publications that accompanies the hardware:

- OC-12c/STM-4c Asynchronous Transfer Mode line card—Refer to the *OC-12c/STM-4c Asynchronous Transfer Mode Line Card Installation and Configuration* publication.
- OC-12c/STM-4c Packet-Over SONET line card—Refer to the *OC-12c/STM-4c Packet-Over-SONET Line Card Installation and Configuration* publication.
- Quad OC-3c/STM-1c Packet-Over SONET line card—Refer to the *Quad OC-3c/STM-1c Packet-Over- SONET Line Card Installation and Configuration* publication.
- Gigabit Route Processor and Ethernet interface on the GRP—Refer to the *Gigabit Route Processor (GRP) Installation and Configuration* publication.

Note New commands associated with the line cards are included in the "Command Reference" section of this feature module.

Loading Cisco IOS Images

Loading a Cisco IOS image on the GRP on a Cisco 12000 series router is the same as loading images on Cisco 7500 series routers. In addition to the Cisco IOS image that resides on the GRP, each line card on the Cisco 12000 series has a Cisco IOS image. When the router is reloaded, the specified Cisco IOS image is loaded onto the GRP, and that image is automatically dowloaded to all the line cards.

For information on how to load Cisco IOS images, refer to the "Loading Images and Configuration Files" chapter in the *Configuration Fundamentals Configuration Guide.* For additional information, refer to the "Observing System Startup and Performing a Basic Configuration" chapter in the *Cisco 12012 Gigabit Switch Router Installation and Configuration Guide*.

Normally, you want the same Cisco IOS image on the GRP and all line cards. However, if you want to upgrade a line card with a new version of microcode for testing or to fix a defect, you might need to load a Cisco IOS image that is different from the one on the line card. Additionally, you might need to load a new image on the line card to work around a problem that is affecting only one of the line cards.

To load a Cisco IOS image on a line card, first use the **copy tftp** command to download the Cisco IOS image to a slot on one of the PCMCIA Flash cards. After you have downloaded the Cisco IOS image on the Flash card, perform the following tasks beginning in global configuration mode:

Task		Command
Step 1	Specify the type of line card, location of the Cisco IOS image, and the slot of the line card to download the image. If the slot number is omitted, the image is downloaded to all line cards.	**microcode** {**oc12-atm** | **oc12-pos** | **oc3-pos-4**} **flash** *file_id slot-number*
Step 2	Reload the image on the specified line card.	**microcode reload** *slot-number*
Step 3	Exit configuration mode.	**exit**
Step 4	Connect to the line card and verify that the new Cisco IOS image is on the line card by checking the version number in the display output.	**execute-on slot** *slot-number* **show version** or **attach** *slot-number* **show version** **exit**

Troubleshooting

The following sections provide some tools to troubleshoot problems on the Cisco 12000 series routers. For more information, refer to the troubleshooting and diagnostic chapters in the Cisco 12000 series installation and configuration guides.

For a listing of system error messages, refer to the “System Error Messages” feature module.

Also refer to the “Monitoring and Maintaining the Cisco 12000 Series” section, later in this document, for information on the **show** commands that might also be useful to troubleshoot problems.

Using Field Diagnostics

Each line card on the Cisco 12000 series can perform field diagnostic testing to isolate faulty hardware without disrupting normal operation of the system. However, performing field diagnostic testing on a line card does halt all activity on the line card for the duration of the testing. After successful completion of the field diagnostic testing, the Cisco IOS software is automatically reloaded on the line card.

Note The field diagnostic **diag** command must be executed from the GRP main console port.

To perform field diagnostic testing on a line card, perform the following tasks in privileged EXEC mode:

Task		Command
Step 1	Specify the line card that you want to perform diagnostic testing on. Optionally, specify that previous test results are displayed, that only extended power-on self-tests (POST) be performed, that the maximum messages are displayed, or that the Cisco IOS software not be reloaded on the line card after successful completion of the tests.	**diag** *slot-number* [**previous** | **post** | **verbose** | **wait**]
Step 2	At the prompt, press **Return** to confirm that you want to perform field diagnostic testing on the specified line card, or type **no** to stop the testing.	`Running Diags will halt ALL activity on the requested slot. [confirm]`

To stop field diagnostic testing on a line card, perform the following tasks in privileged EXEC mode:

Task	Command
Specify the line card that you want to stop perform diagnostic testing on.	**diag** *slot-number* **halt** or **no diag** *slot-number*

Note When you stop the field diagnostic test, the line card remains down (that is, in an unbooted state). In most cases, you stopped the testing because you need to remove the line card or replace the line card. If that is not the case and you want to bring the line card back up (that is, on-line), you must use the **microcode reload** global configuration command or power cycle the line card.

Storing Line Card Crash Information

This section explains how to enable storing of crash information for a line card and optionally specify the type and amount of information stored. Technical support representatives need to be able to look at the crash information from the line card to troubleshoot serious problems on the line card. The crash information contains all the line card memory information including the main memory and transmit and receive buffer information.

Caution Use the **exception linecard** global configuration command only when directed by a technical support representative and only enable options that the technical support representative requests you to enable.

To enable and configure the crash information options for a line card, perform the following task in global configuration mode:

Task	Command
Specify the line card that you want crash information for when a line card resets. Optionally, specify the type and amount of memory to be stored.	**exception linecard** {**all** | **slot** *number*} [**corefile** *filename* | **main-memory** *size* [**k** | **m**] | **queue-ram** *size* [**k** | **m**] | **rx-buffer** *size* [**k** | **m**] | **sqe-register-rx** | **sqe-register-tx** | **tx-buffer** *size* [**k** | **m**]]

Monitoring and Maintaining the Cisco 12000 Series

The following sections describe some of the **show** commands you can use to obtain information about the Cisco 12000 series, describe how to set the LED message on the line cards, and describe the software components on the Cisco 12000 series and how to obtain information about these components.

Displaying System Information Using Show Commands

To provide information about system processes, the Cisco IOS software includes an extensive list of EXEC commands that begin with the word **show**, which, when executed, display detailed tables of system information. Following is a list of some of the common **show** commands.

To use the **show** commands on a line card, you can use the **execute-on** privileged EXEC command or you can connect to the Cisco IOS image running on the line card by using the **attach** privileged EXEC command.

Refer to the “Command Reference” section for detailed command syntax for the new or modified commands listed in this section.

Perform these tasks in privileged EXEC mode to display the information described:

Task	Command
Display information about the hardware.	**show controllers**
Display information stored in NVRAM when the router crashes. This command is only useful to technical support representatives.	**show context**
Display part number, revision number, and version number information for the line cards.	**show diag**
Display the current environmental specifications.	**show environment**
Display hardware information.	**show gsr**
Display the state of syslog error and event logging.	**show logging**
Display memory pool statistics including summary information about the activities of the system memory allocator and a block-by-block listing of memory use.	**show memory**
Display the microcode bundled into the system image.	**show microcode**
Display information about all active processes.	**show processes**
Display the configured protocols.	**show protocols**

Task	Command
Display stack usage of processes and interrupt routines, including the reason for the last system reboot. This command is only useful to your technical support representative.	**show stacks**
Display the status of TCP connections.	**show tcp**
Display a concise description of TCP connection endpoints.	**show tcp brief** [**all**]
Display general information about the router when reporting a problem.	**show tech-support** [**page**] [**password**]
Display configuration of the system hardware, the software version, the names and sources of configuration files, and the boot image.	**show version**

Setting the LED Message on the Line Cards

You can specify the message that is displayed on the LED on the front panel of one or more line cards. You can also remove the user-specified message that is displayed on the LED on the front panel of one or more line cards and revert to the normal status message for the line card.

To set or clear the LED message, perform one of the following tasks in privileged EXEC mode:

Task	Command
Set the message displayed on the LED on the front panel of one or more line cards.	**set card-message** {**all** | **slot** *number*} [**expire** *seconds*] [**blink** *seconds*] *message*
Clear the user-specified message that is displayed on the LED on the front panel of one or more line cards and revert to the normal status message for the line card.	**clear card-message** {**all** | **slot** *number*}

Understanding Software Components

There are many software components bundled with the Cisco IOS image for the Cisco 12000 series. In most cases you do not need to know about these components; however, during troubleshooting, you might be asked for the specific version number of the various components. Table 1 describes these software components, including those that are bundled with the Cisco IOS image for the Cisco 12000 series and lists the command you would use to determine the version of the component.

Note The syntax for the **show controller** command listed in Table 1 is complex. For details on the command syntax, refer to the “Command Reference” section.

Table 1 Software Components in Cisco 12000 Series GSRs

Software Component	Description	Version Information
MBus Agent Code	MBus agent code is bundled with the Cisco IOS image on the GRP card. When the router is powered on, the MBus agent powers on the GRP card.	**show diag**[1]
GRP Cisco IOS Image	Cisco IOS image that runs on the GRP card. This is the main image for the Cisco 12000 series GSR. It contains images for all the line card types and various microcode bundles.	**show version**
GRP Boot Image	Cisco IOS image that runs on the GRP when it is booting from the network. This image is essentially the same as the Cisco IOS image, but it has large portions of the routing software removed because it only acts as an IP host to boot the router. It has all the same line card images and microcode bundles as the Cisco IOS image.	**show version**
Line Card Fabric Downloader	Code that the MBus downloads to the line card so the Cisco IOS image can be downloaded from the GRP over the switch fabric. This is a bootstrap loader that knows how to run the fabric only. There is only one version of the downloader, and it is bundled with the GRP Cisco IOS image.	**show diag**
Line Card Cisco IOS Image	Cisco IOS image that runs on the line card. This image is the main operational code for the line card, and the image senses the type of line card it is running on and adapts. It also supports all variants of the line card. The line card Cisco IOS image is bundled in the GRP Cisco IOS image.	**execute-on slot** *slot-number* **show version** or **attach** *slot-number* **show version**| **exit**
SQE Microcode	Silicon queuing engine microcode on the line card that controls the data paths on the line card. A different microcode image might exist for each type of line card and different microcode images support different Cisco IOS features (for example, weighted fair queueing). There is a default microcode image that is used when no special features or requirements exist. The SQE microcode is bundled with the line card Cisco IOS image.	**execute-on slot** *slot-number* **show controllers tofab bma microcode** **execute-on slot** *slot-number* **show controllers frfab bma microcode** or **attach** *slot-number* **show controllers tofab bma microcode** **show controllers frfab bma microcode** **exit**
ATM OC-12 SAR Microcode	Microcode from the vendor of the SAR-622 chip used on the ATM line card. The ATM SAR microcode is bundled with the line card Cisco IOS image.	**execute-on slot** *slot-number* **show controllers atm** or **attach** *slot-number* **show controllers atm** **exit**
GRP Field Diagnostic Image	Image that runs on the GRP when field diagnostics are run with the **diag** command.	None

Table 1 Software Components in Cisco 12000 Series GSRs (Continued)

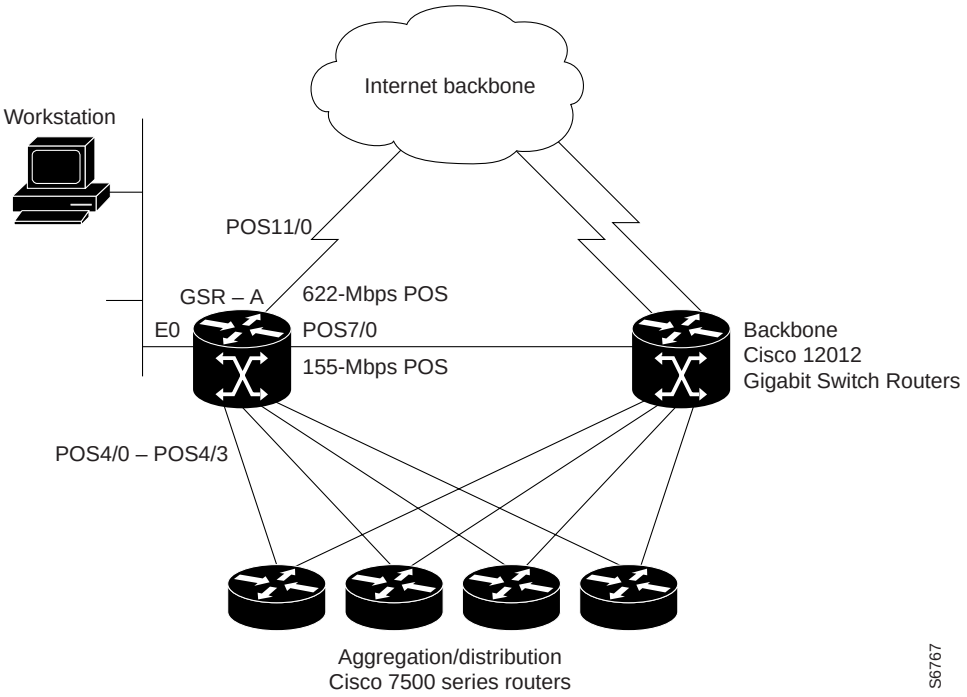
Software Component	Description	Version Information
Line Card Field Diagnostic Image	Image that runs on the line card when field diagnostics are run with the **diag** command.	None
GRP ROM Monitor	The ROM monitor is responsible for booting the system from the local Flash devices. It is loaded into the Flash ROM on the GRP when the board is manufactured.	**show version**
Line Card ROM Monitor	The ROM monitor is responsible for booting the line card via the MBus. It is loaded into the Flash ROM on the line card when the board is manufactured.	**execute-on slot** *slot-number* **show version** or **attach** *slot-number* **show version** **exit**
ROM Monitor Library Image	Image that allows the GRP ROM monitor to access the internal Flash bank and PCMCIA Flash cards. It is bundled with the GRP Cisco IOS image so it can be put on the Flash cards when they are formatted. The GRP ROM monitor gets the ROM monitor image from the Flash device before accessing it.	None

1. You can also get version information from the first LED message.

Configuration Example

In a typical Internet service provider environment, the Cisco 12000 series routers reside within the core of the network and can support as many as 44 OC-3/STM-1 IP over SONET/SDH optical links to Cisco 7500 series routers or aggregation devices. Below is a typical configuration file for the Cisco 12012. Important configuration commands are bolded. In this example, a Cisco 12000 series router called GSR-A connects to the Internet backbone through interface POS11/0, connects to a second Cisco 12000 series router through interface POS7/0, and connects to Cisco 7500 series routers through interfaces POS4/0, POS4/1, POS4/2, and POS4/3. In addition, GSR-A also has a connection to a workstation through interface E0 for TFTP functions only (no routing is performed).

Note In this example, SONET payload scrambling is enabled with the **pos scramble-atm** command. SONET payload scrambling applies a self-synchronous scrambler (x^43+1) to the Synchronous Payload Envelope (SPE) of the interface to ensure sufficient bit transition density. Both sides of the connection must be configured using the **pos scramble-atm** command. Currently, when connecting to a Cisco 7500 series router and using the **pos scramble-atm** command, you must specify the **crc 16** command rather than the **crc 32** command.



Note Distributed Cisco Express Forwarding (CEF) is automatically enabled. Enable other CEF features to meet your network configuration requirements.

```
Current configuration:
!
! Last configuration change at 15:41:46 PDT Tue Sep 30 1997
! NVRAM config last updated at 15:29:07 PDT Tue Sep 30 1997
!
version 11.2
service timestamps debug datetime msec localtime
service timestamps log datetime msec localtime
service internal
service udp-small-servers
service tcp-small-servers
!
hostname GSR-A
!
boot host config.dat 223.255.255.254
boot system banana/bfr/gsr-p-mz.fib20 223.255.255.254
boot system flash slot1:gsr-p-mz
boot system flash slot1:gsr-p-mz.fib19
boot bootldr bootflash:gsr-boot-mz.fib20
enable password 7 1222227220E09
!
ip subnet-zero
no ip domain-lookup
ip host peaches 223.255.254.254
ip host oranges 223.255.254.253
```

```
! Enable CLNS routing on the router
clns routing
clock timezone PST -8
clock summer-time PDT recurring
clock calendar-valid
!
interface Loopback0
 ip address 1.1.1.31 255.255.255.255
 bandwidth 10000000
! Configure the Ethernet interface used for TFTP from the workstation
interface Ethernet0
 ip address 16.4.237.10 255.255.0.0
 ip broadcast-address 16.4.255.255
! Interfaces POS4/0 through POS4/3 are the OC3c connections
! to the Cisco 7500 series routers with scrambling
interface POS4/0
 ip address 71.1.0.2 255.255.0.0
 pos scramble-atm
 crc 16
 clock source internal
!
interface POS4/1
 ip address 71.2.0.2 255.255.0.0
 pos scramble-atm
 crc 16
 clock source internal
!
interface POS4/2
 ip address 71.3.0.2 255.255.0.0
 pos scramble-atm
 crc 16
 clock source internal
!
interface POS4/3
 ip address 102.102.102.1 255.255.255.0
 ip broadcast-address 102.102.102.255
 pos scramble-atm
 crc 16
 clock source internal
! Interface POS7/0 is the OC12 connection
! to the second Cisco 12012 router
interface POS7/0
 ip address 101.101.101.1 255.255.255.0
 pos scramble-atm
 crc 32
 clock source internal
! Interface POS11/0 is the OC12 connection
! to the Internet
interface POS11/0
 ip address 103.103.103.1 255.255.255.0
 pos scramble-atm
 crc 32
 clock source internal
! Routing configured for the Ethernet interface (optional)
router eigrp 1009
 passive-interface Ethernet0
 network 107.0.0.0
 network 108.0.0.0
!
router isis
 redistribute connected metric 0 metric-type internal level-2
 passive-interface Loopback0
 net 47.0000.0031.0031.0000.0031.00
 is-type level-2-only
! Routing configured for the Ethernet interface
```

```
router igrp 199
 network 16.0.0.0
!
router bgp 10
 no synchronization
 redistribute connected
 redistribute static
 neighbor 1.1.1.3 remote-as 10
 neighbor 1.1.1.3 update-source Loopback0
 neighbor 1.1.1.13 remote-as 10
 neighbor 1.1.1.13 update-source Loopback0
 neighbor 1.1.1.20 remote-as 10
 neighbor 1.1.1.20 update-source Loopback0
 no auto-summary
!
ip classless
ip default-network 33.0.0.0
ip route 33.0.0.0 255.0.0.0 33.34.0.0
ip route 223.255.0.0 255.255.0.0 Ethernet0
ip route 223.255.253.0 255.255.255.0 16.4.0.1
ip route 223.255.254.0 255.255.255.0 16.4.0.1
logging buffered 2000000 debugging
no logging console
tftp-server flash slot0:rsp-tpgenv-m.CZ.vjp alias rsp-tpgenv-m.CZ.vjp
!
snmp-server community public RO
snmp-server community passthru RW
snmp-server location HighEnd,Bldg.B,San Jose,CA
snmp-server contact Curt Applebee (capplebee@company.com)
!
line con 0
 exec-timeout 0 0
 password secret1
 login
line aux 0
 exec-timeout 0 0
 transport input all
line vty 0 4
 exec-timeout 0 0
 password secret2
 login
!
ntp clock-period 17179665
ntp update-calendar
no scheduler max-task-time
end
```

Command Reference

This section documents new or modified commands. All other commands used with this feature are documented in the Cisco IOS Release 11.2 command references.

Note The **pos internal-clock** interface configuration command has been replaced by the **clock source** interface configuration command. The **pos transmitter-delay** interface configuration command has been replaced by the **transmitter-delay** interface configuration command.

- **attach**
- **atm sonet**
- **clear card-message**
- **clear logging**
- **diag**
- **exception linecard**
- **execute-on**
- **logging linecard**
- **microcode (Cisco IOS image)**
- **microcode reload**
- **pos flag**
- **pos framing**
- **pos scramble-atm**
- **set card-message**
- **show context**
- **show controllers (GRP image)**
- **show controllers (line card image)**
- **show diag**
- **show environment**
- **show gsr**
- **show logging**

attach

To access the Cisco IOS software image on a line card to monitor and maintain information on the line card, use the **attach** privileged EXEC command. To exit from the Cisco IOS software image on the line card and return to the Cisco IOS image on the GRP card, use the **exit** command.

attach *slot-number*

Syntax Description

slot-number	Slot number of the line card you want to connect to. Slot numbers range from 0 to 11 for the Cisco 12012 and 0 to 7 for the Cisco 12008. If the slot number is omitted, you are prompted for the slot number.

Default

Access to the Cisco IOS software image running on the GRP card.

Command Mode

Privileged EXEC

Usage Guidelines

This command was added in Cisco IOS Release 11.2 GS to support the Cisco 12000 series Gigabit Switch Routers.

Use the **attach** EXEC command to get specific information about a line card.

After you connect to the Cisco IOS image on the line card using the **attach** command, the prompt changes to "LC-Slot*x*#," where *x* is the slot number of the line card.

You can also use the **execute-on slot** privileged EXEC command to execute commands on one or all line cards.

Note Do not execute the **config** command from the Cisco IOS software image on the line card.

Note Because not all statistics are maintained on the line cards, the output from some of the **show** commands might not be consistent.

Example

The following example connects to the Cisco IOS image running on the line card in slot 9, gets a list of valid **show** commands, and returns the Cisco IOS image running on the GRP:

```
Router# attach 9
Entering Console for 4 Port Packet Over SONET OC-3c/STM-1 in Slot: 9
Type exit to end this session

Press RETURN to get started!

LC-Slot9# show ?
  cef       Cisco Express Forwarding
  clock     Display the system clock
  context   Show context information about recent crash(s)
  history   Display the session command history
  hosts     IP domain-name, lookup style, nameservers, and host table
  ipc       Interprocess communications commands
  location  Display the system location
  sessions  Information about Telnet connections
  terminal  Display terminal configuration parameters
  users     Display information about terminal lines
  version   System hardware and software status

LC-Slot9# exit

Disconnecting from slot 9.
Connection Duration: 00:01:04
Router#
```

Related Commands

execute-on slot

atm sonet

To set the mode of operation and thus control type of the ATM cell used for cell-rate decoupling on the SONET PLIM, use the **atm sonet** interface configuration command. To restore the default Synchronous Transport Signal level 12, concatenated (STS-12c) operation, use the **no** form of this command.

atm sonet [**stm-4**]
no atm sonet [**stm-4**]

Syntax Description

stm-4	(Optional) Synchronous Digital Hierarchy/Synchronous Transport Signal level 4 (SDH/STM-4) operation (ITU-T specification).

Default

STS-12c

Command Mode

Interface configuration

Usage Guidelines

This command was modified in Cisco IOS Release 11.2 GS to add the **stm-4** keyword.

Use STM-4 in applications where SDH framing is required.

Use the default (STS-12c) in applications where the ATM switch requires "unassigned cells" for rate adaptation. An unassigned cell contains 32 zeros.

Example

The following example sets the mode of operation to SONET STM-4 on ATM interface 3/0:

```
Router(config)# interface atm 3/0
Router(config-if)# atm sonet stm-4
Router(config-if)# end
Router#
```

clear card-message

To remove the user-specified message that is displayed on the LED on the front panel of one or more line cards and revert to the normal status message for the line card, use the **clear card-message** privileged EXEC command.

clear card-message {**all** | **slot** *slot-number*}

Syntax Description

all	Clears the user-specified LED message on all line cards.
slot *slot-number*	Clears the user-specified LED message on a specific line card. Slot numbers range from 0 to 11 for the Cisco 12012 and 0 to 7 for the Cisco 12008.

Command Mode

Privileged EXEC

Usage Guidelines

This command was added in Cisco IOS Release 11.2 GS to support the Cisco 12000 series Gigabit Switch Routers.

To specify the message that is displayed on the LED on the front panel of one or more line cards, use the **set card-message** global configuration command.

Example

The following example clears any user-specified message from all line cards.

```
Router# clear card-message all
Router#
```

Related Commands

set card-message

clear logging

To clear messages from the logging buffer, use the **clear logging** privileged EXEC command.

clear logging {**all** | **slot** *slot-number*} [**counts** | **messages**]

Syntax Description

all	Clears the logging buffer for all slots.
slot *slot-number*	Clears the logging buffer for a specific slot. Slot numbers range from 0 to 11 for the Cisco 12012 and 0 to 7 for the Cisco 12008.
counts	(Optional) Clears the message counters only from the logging buffer. The messages are kept.
messages	(Optional) Clears the messages from logging buffer (that is, discard all messages in the log).

Default

If no options are specified, clear the counters and messages from the logging buffer for all line cards.

Command Mode

Privileged EXEC

Usage Guidelines

This command was modified in Cisco IOS Release 11.2 GS to include the **all**, **slot**, **counts**, and **messages** keywords.

Use the **show logging** command to display logging information.

Example

In the following example, the counters and messages are cleared from the logging buffer on all line cards. The **show logging** command shows the information before and after the log is cleared.

```
Router# show logging
Syslog logging: enabled (0 messages dropped, 0 flushes, 0 overruns)
    Console logging: level debugging, 32 messages logged
    Monitor logging: level debugging, 0 messages logged
    Trap logging: level informational, 189 message lines logged
    Buffer logging: level debugging, 32 messages logged

Log Buffer (1638 bytes):

2d17h: %SCHED-3-THRASHING: Process thrashing on watched managed timer (0x608610B0).
-Process= “User LED Message Process”, ipl= 6, pid= 14
-Traceback= 600CF7F0 600CFB18 60128900 600BFF88 600BFF74
2d17h: %SCHED-3-STUCKMTMR: Sleep w/expired mgd timer 6085F090, time 0xE151558 (0
0:00:07 ago).
-Process= “User LED Message Process”, ipl= 6, pid= 14
-Traceback= 600CF750 600CFB18 60128900 600BFF88 600BFF74
...
Router# clear logging
Clear logging buffer [confirm]

Router# show logging
Syslog logging: enabled (0 messages dropped, 0 flushes, 0 overruns)
    Console logging: level debugging, 33 messages logged
    Monitor logging: level debugging, 0 messages logged
    Trap logging: level informational, 192 message lines logged
    Buffer logging: level debugging, 33 messages logged

Log Buffer (1638 bytes):
Router#
```

Related Commands

logging buffered
logging linecard
show logging

diag

To perform field diagnostics on a line card, on the Gigabit Route Processor (GRP), on the Switch Fabric Cards (SFC), and on the Clock Scheduler Card (CSC) in the Cisco 12000 series Gigabit Switch Routers, use the **diag** privileged EXEC command. To disable field diagnostics on a line card, use the **no** form of this command.

diag *slot-number* [**halt** | **previous** | **post** | **verbose** [**wait**] | **wait**]
no diag *slot-number*

Syntax Description

slot-number	Slot number of the line card you want to test. Slot numbers range from 0 to 11 for the Cisco 12012 and 0 to 7 for the Cisco 12008. Slot numbers for the CSC are 16 and 17 and for the FSC are18, 19, and 20.
halt	(Optional) Stops the field diagnostic testing on the line card.
previous	(Optional) Displays previous test results (if any) for the line card.
post	(Optional) Initiates a EPROM-based extended power-on self-test (EPOST) only. The EPOST test suite is not as comprehensive as the field diagnostics, and a pass/fail message is the only message displayed on the console.
verbose [**wait**]	(Optional) Enables the maximum status messages to be displayed on the console. By default, only the minimum status messages are displayed on the console. If you specify the optional **wait** keyword, the Cisco IOS software is not be automatically reloaded on the line card after the test completes successfully.
wait	(Optional) Stops the automatic reloading of the Cisco IOS software on the line card after the successful completion of the field diagnostic testing. If you use this keyword, you must use the **microcode reload** *slot* global configuration command, or manually remove and insert the line card (to power it up) in the slot so that the GRP will recognize the line card and download the Cisco IOS software image to the line card.

Default

No field diagnostics tests are performed on the line card.

Command Mode

Privileged EXEC

Usage Guidelines

This command was added in Cisco IOS Release 11.2 GS to support the Cisco 12000 series Gigabit Switch Routers.

Note The **diag** command must be executed from the GRP main console port.

Perofrm diagnostics on the CSC only if a redendant CSC is in the router.

Diagnostics will stop and ask you for confirmation before altering the router's configuration. For example, running diagnostics on a SFC or CSC will cause the fabric to go from full bandwidth to one quarter bandwidth. Bandwidth is not affected by GRP or line card diagnostics.

The field diagnostic software image is bundled with the Cisco IOS software and is downloaded automatically from the GRP to the target line card prior to testing.

Caution Performing field diagnostics on a line card stops all activity on the line card. Before the **diag** EXEC command begins running diagnostics, you are prompted to confirm the request to perform field diagnostics on the line card.

In normal mode, if a test fails, the title of the failed test is displayed on the console. However, not all tests that are preformed are displayed. To view all the tests that are performed, use the **verbose** keyword.

After all diagnostic tests are completed on the line card, a PASSED or TEST FAILURE message is displayed. If the line card sends a PASSED message, the Cisco IOS software image on the line card is automatically reloaded unless the **wait** keyword is specified. If the line card sends a TEST FAILURE message, the Cisco IOS software image on the line card is not automatically reloaded.

If you want to reload the line card after it fails diagnostic testing, use the **microcode reload** *slot* global configuration command.

Note When you stop the field diagnostic test, the line card remains down (that is, in an unbooted state). In most cases, you stopped the testing because you need to remove the line card or replace the line card. If that is not the case, and you want to bring the line card back up (that is, online), you must use the **microcode reload** global configuration command or power cycle the line card.

If the line card fails the test, the line card is defective and should be replaced. In future releases this might not be the case because DRAM and SDRAM SIMM modules might be field replaceable units. For example, if the DRAM test failed you might only need to replace the DRAM on the line card.

For more information, refer to the Cisco 12000 series installation and configuration guides.

Examples

The following example shows the output when field diagnostics are performed on the line card in slot 3. After the line card passes all field diagnostic tests, the Cisco IOS software is automatically reloaded on the card. Before starting the diagnostic tests, you must confirm the request to perform these tests on the line card because all activity on the line card is halted. The total/indiv. timeout set to 600/220 sec. message indicates that 600 seconds are allowed to perform all field diagnostics tests, and that no single test should exceed 220 seconds to complete.

```
Router# diag 3
Running Diags will halt ALL activity on the requested slot. [confirm]
Router#
Launching a Field Diagnostic for slot 3
Running DIAG config check
RUNNING DIAG download to slot 3 (timeout set to 400 sec.)
sending cmd FDIAG-DO ALL to fdiag in slot 3
(total/indiv. timeout set to 600/220 sec.)
Field Diagnostic ****PASSED**** for slot 3
```

```
Field Diag eeprom values: run 159 fial mode 0 (PASS) slot 3
   last test failed was 0, error code 0
sending SHUTDOWN FDIAG_QUIT to fdiag in slot 3

Board will reload
...
Router#
```

The following example shows the output when field diagnostics are performed on the line card in slot 3 in verbose mode.

```
Router# diag 3 verbose
Running Diags will halt ALL activity on the requested slot. [confirm]
Router#
Launching a Field Diagnostic for slot 3
Running DIAG config check
RUNNING DIAG download to slot 3 (timeout set to 400 sec.)
sending cmd FDIAG-DO ALL to fdiag in slot 3
(total/indiv. timeout set to 600/220 sec.)
FDIAG_STAT_IN_PROGRESS: test #1 R5K Internal Cache
FDIAG_STAT_PASS test_num 1
FDIAG_STAT_IN_PROGRESS: test #2 Sunblock Ordering
FDIAG_STAT_PASS test_num 2
FDIAG_STAT_IN_PROGRESS: test #3 Dram Datapins
FDIAG_STAT_PASS test_num 3
...
Field Diags: FDIAG_STAT_DONE
Field Diagnostic ****PASSED**** for slot 3
Field Diag eeprom values: run 159 fial mode 0 (PASS) slot 3
   last test failed was 0, error code 0
sending SHUTDOWN FDIAG_QUIT to fdiag in slot 3

Board will reload
...
Router#
```

Related Commands

microcode reload

exception linecard

To enable storing of crash information for a line card and optionally specify the type and amount of information stored, use the **exception linecard** global configuration command. To disable the storing of crash information for the line card, use the **no** form of this command.

exception linecard {**all** | **slot** *slot-number*} [**corefile** *filename* | **main-memory** *size* [**k** | **m**] | **queue-ram** *size* [**k** | **m**] | **rx-buffer** *size* [**k** | **m**] | **sqe-register-rx** | **sqe-register-tx** | **tx-buffer** *size* [**k** | **m**]]
no exception linecard

Syntax Description

all	Stores crash information for all line cards.
slot *slot- number*	Stores crash information for the line card in the specified slot. Slot numbers range from 0 to 11 for the Cisco 12012 and 0 to 7 for the Cisco 12008.
corefile *filename*	(Optional) Stores the crash information in the specified file in NVRAM. The default file name is *hostname*-**core**-*slot-number* (for example, c12012-core-8).
main-memory *size*	(Optional) Stores the crash information for the main memory on the line card and specify the size of the crash information. Size of the memory to store is 0 to 268435456.
queue-ram *size*	(Optional) Stores the crash information for the queue RAM memory on the line card and specify the size of the crash information. Size of the memory to store can be from 0 to 1048576.
rx-buffer *size* **tx-buffer** *size*	(Optional) Stores the crash information for the receive and transmit buffer on the line card and specify the size of the crash information. Size of the memory to store can be from 0 to 67108864.
sqe-register-rx **sqe-register-tx**	(Optional) Stores crash information for the receive or transmit silicon queueing engine registers on the line card.
k **m**	(Optional) The **k** option multiplies the specified *size* by 1K (1024), and the **m** option multiplies the specified *size* by 1M (1024*1024).

Default

No crash information is stored for the line card.

If enabled with no options, the default is to store 256 MB of main memory.

Command Mode

Global configuration

Usage Guidelines

This command was added in Cisco IOS Release 11.2 GS to support the Cisco 12000 series Gigabit Switch Routers.

Use the **exception linecard** global configuration command only when directed by a technical support representative and only enable options that the technical support representative requests you to enable. Technical support representatives need to be able to look at the crash information from the line card to troubleshoot serious problems on the line card. The crash information contains all the line card memory information including the main memory and transmit and receive buffer information.

Caution Use caution when enabling the **exception linecard** global configuration command. Enabling all options could cause a large amount (150 to 250 MB) of crash information to be sent to the server

Example

The following example enables the storing of crash information for line card 8. By default, 256 MB of main memory is stored.

```
Router(config)# exception linecard slot 8
Router(config)# end
Router#
```

execute-on

To execute commands remotely on a line card, use the **execute-on slot** privileged EXEC command.

execute-on {**slot** *slot-number* | **all**} *command*

Syntax Description

slot-number	Executes the command on the line card in the specified slot. Slot numbers range from 0 to 11 on the Cisco 12012 and 0 to 7 on the Cisco 12008.
all	Executes the command on all line cards.
command	Cisco IOS command to execute on the line card.

Command Mode

Privileged EXEC

Usage Guidelines

This command was added in Cisco IOS Release 11.2 GS to support the Cisco 12000 series Gigabit Switch Routers.

Use this command to execute a command on one or all line cards to monitor and maintain information on one or more line cards.

You can use the **execute-on** privileged EXEC command only from Cisco IOS software running on the GRP card.

Note In Cisco IOS Release 11.2(9)GS, the **execute-on** command does not work properly on commands that require input, the “more” autopaging mechanism does not function, and the line card help is not available.

Note Because not all statistics are maintained on the line cards, the output from some of the **show** commands might not be consistent.

You can also use the **attach** privileged EXEC command, but using the **execute-on slot** command saves you some steps. For example, first you must use the **attach** command to connect you to the Cisco IOS software running on the line card, next you must issue the command, and finally you must disconnect from the line card to return to the Cisco IOS software running on the GRP card. With the **execute-on slot** command, you can perform three steps with one command.

In addition, the **execute-on all** command allows you to perform the same command on all line cards.

Example

The following example shows how to execute the **show controllers** command on the line card in slot 4:

```
Router# execute-on slot 4 show controllers
========= Line Card (Slot 4) =======

Interface POS0
Hardware is BFLC POS
lcpos_instance struct   6033A6E0
RX POS ASIC addr space  12000000
TX POS ASIC addr space  12000100
SUNI framer addr space  12000400
SUNI rsop intr status   00
CRC16 enabled, HDLC enc, int clock
no loop

Interface POS1
Hardware is BFLC POS
lcpos_instance struct   6033CEC0
RX POS ASIC addr space  12000000
TX POS ASIC addr space  12000100
SUNI framer addr space  12000600
SUNI rsop intr status   00
CRC32 enabled, HDLC enc, int clock
no loop

Interface POS2
Hardware is BFLC POS
lcpos_instance struct   6033F6A0
RX POS ASIC addr space  12000000
TX POS ASIC addr space  12000100
SUNI framer addr space  12000800
SUNI rsop intr status   00
CRC32 enabled, HDLC enc, int clock
no loop

Interface POS3
Hardware is BFLC POS
lcpos_instance struct   60341E80
RX POS ASIC addr space  12000000
TX POS ASIC addr space  12000100
SUNI framer addr space  12000A00
SUNI rsop intr status   00
CRC32 enabled, HDLC enc, ext clock
no loop
Router#
```

Related Commands

attach

logging linecard

To log messages to an internal buffer on a line card, use the **logging linecard** global configuration command. To cancel the use of the internal buffer on the line cards, use the **no** form of this command.

logging linecard [*size* | *message-level*]
no logging linecard

Syntax Description

size — (Optional) Size of the buffer used for each line card. The range is 4096 to 65536 bytes. The default is 8 KB.

message-level — (Optional) Limits the logging of messages displayed on the console terminal to a specified level. The message level can be:

- **alerts**—Immediate action needed
- **critical**—Critical conditions
- **debugging**—Debugging messages
- **emergencies**—System is unusable
- **errors**—Error conditions
- **informational**—Informational messages
- **notifications**—Normal but significant conditions
- **warnings**—Warning conditions

Default

The Cisco IOS software logs messages to the internal buffer on the GRP card.

Command Mode

Global configuration

Usage Guidelines

This command was added in Cisco IOS Release 11.2 GS to support the Cisco 12000 series Gigabit Switch Routers.

Specifying a message level causes messages at that level and numerically lower levels to be stored in the internal buffer on the line cards. Table 2 lists the message levels and associated numerical level. For example, if you specify a message level of critical, all critical, alert, and emergency messages will be logged.

Table 2 Message Levels

Level Name	Level
emergencies	0
alerts	1
critical	2

Table 2 Message Levels (Continued)

Level Name	Level
errors	3
warnings	4
notifications	5
informational	6
debugging	7

To display the messages that are logged in the buffer, use the EXEC command **show logging slot**. The first message displayed is the oldest message in the buffer.

Do not make the buffer size too large because the router could run out of memory for other tasks. You can use the **show memory** EXEC command to view the free processor memory on the router; however, this is the maximum available and should not be approached.

Example

The following example enables logging to an internal buffer on the line cards using the default buffer size and logging warning, error, critical, alert, and emergency messages:

```
Router(config)# logging linecard warnings
Router(config)# end
Router#
```

Related Commands

clear logging
show logging

microcode (Cisco IOS image)

To load a Cisco IOS software image on a line card from Flash memory or the GRP card on a Cisco 12000 series Gigabit Switch Router, use the **microcode** global configuration command. To load the microcode bundled with the GRP system image, use the **no** form of this command.

microcode *interface* {**flash** *file-id* [*slot*] | **system** [*slot*]}
no microcode *interface* [**flash** *file-id* [*slot*] | **system** [*slot*]]

Syntax Description

interface	One of the following interface names: **oc12-atm**, **oc12-pos**, or **oc3-pos-4**.
flash	Loads the image from the Flash file system.
file-id	Specifies the device and filename of the image file to download. A colon (:) must separate the device and filename (for example, slot0:gsr-p-mz). Valid devices are as follows: • **bootflash**—Internal Flash memory. • **slot0**—First PCMCIA slot. • **slot1**—Second PCMCIA slot.
slot	(Optional) Slot number of the line card that you want to copy the software image to. Slot numbers range from 0 to 11 for the Cisco 12012 and 0 to 7 for the Cisco 12008. If you do not specify a slot number, the Cisco IOS software image is downloaded on all line cards.
system	Loads the image from the software image on the GRP card.

Default

The default is to load the image from the GRP card.

Command Mode

Global configuration

Usage Guidelines

This command was modified in Cisco IOS Release 11.2 GS to load the Cisco IOS software image onto a line card in the Cisco 12000 series Gigabit Switch Routers.

In addition to the Cisco IOS image that resides on the GRP card, each line card on a Cisco 12000 series has a Cisco IOS image. When the router is reloaded, the specified Cisco IOS image is loaded onto the GRP card, and that image is automatically dowloaded to all the line cards.

Normally, you want the same Cisco IOS image on the GRP card and all line cards. However, if you want to upgrade a line card with a new version of microcode for testing or to fix a defect, you might need to load a Cisco IOS image that is different from the one on the line card. Additionally, you might need to load a new image on the line card to work around a problem that is affecting only one of the line cards.

To load a Cisco IOS image on a line card, first use the **copy tftp** command to download the Cisco IOS image to a slot on one of the PCMCIA Flash memory cards. After you have downloaded the Cisco IOS image on the Flash memory card, use the **microcode** command to download the image to the line card followed by the **microcode reload** command to start the image. To verify that the correct image is running on the line card, use the **execute-on slot** *slot* **show version** command.

For information on how to load Cisco IOS images, refer to the "Loading Images and Configuration Files" chapter in the *Configuration Fundamentals Configuration Guide.* For additional information, refer to the "Observing System Startup and Performing a Basic Configuration" chapter in the Cisco 12000 series installation and configuration guides.

Examples

In the following example, the Cisco IOS software image in slot 0: is downloaded to the line card in slot 10. This is the software image that is used when the system is booted, when a line card is inserted or removed, or when the **microcode reload** global configuration command is issued.

To verify that the correct version is loaded, use the **execute-on slot 10 show version** command.

```
Router(config)# microcode oc3-POS-4 flash slot0:fip.v141-7 10
Router(config)# microcode reload 10
Router(config)# exit
Router#
```

Related Commands

microcode reload

microcode reload

To reload the Cisco IOS image on a line card on Cisco 12000 series routers after all microcode configuration commands have been entered, use the **microcode reload** global configuration command.

microcode reload [*slot-number*]

Syntax Description

slot-number	(Optional) Slot number of the line card that you want to reload the Cisco IOS software image on. Slot numbers range from 0 to 11 for the Cisco 12012 and 0 to 7 for the Cisco 12008. If you do not specify a slot number, the Cisco IOS software image is reloaded on all line cards.

Command Mode

Global configuration

Usage Guidelines

This command was modified in Cisco IOS Release 11.2 GS to add the *slot-number* option.

In addition to the Cisco IOS image that resides on the GRP card, each line card on Cisco 12000 series routers has a Cisco IOS image. When the router is reloaded, the specified Cisco IOS image is loaded onto the GRP card, and that image is automatically dowloaded to all the line cards.

Normally, you want the same Cisco IOS image on the GRP card and all line cards. However, if you want to upgrade a line card with a new version of microcode for testing or to fix a defect, you might need to load a Cisco IOS image that is different from the one on the line card. Additionally, you might need to load a new image on the line card to work around a problem that is affecting only one of the line cards.

To load a Cisco IOS image on a line card, first use the **copy tftp** command to download the Cisco IOS image to a slot on one of the PCMCIA Flash memory cards. After you have downloaded the Cisco IOS image on the Flash memory card, use the **microcode** command to download the image to the line card followed by the **microcode reload** command to start the image. To verify that the correct image is running on the line card, use the **execute-on slot** *slot* **show version** command.

For information on how to load Cisco IOS images, refer to the “Loading Images and Configuration Files” chapter in the *Configuration Fundamentals Configuration Guide.* For additional information, refer to the “Observing System Startup and Performing a Basic Configuration” chapter in the Cisco 12000 series installation and configuration guides.

Example

In the following example, the Cisco IOS software is reloaded on the line card in slot 10:

```
Router(config)# microcode reload 10
Router(config)# end
Router#
```

Related Commands

microcode (Cisco IOS image)
microcode query

pos flag

To set the SONET overhead bytes in the frame header to meet a specific standards requirement or to ensure interoperability with another vendor's equipment, use the **pos flag** interface configuration command. To remove the setting of the SONET overhead bytes, use the **no** form of this command.

pos flag {**c2** | **j0** | **s1s0**} *value*
no pos flag {**c2** | **j0** | **s1s0**} *value*

Syntax Description

c2 *value*	Path signal identifier used to identify the payload content type. Use the following values to tell the SONET transmission equipment the payload type: • For PPP (or HDLC when required), use 0xCF (this is the default). • For ATM, use 0x13. • For other equipment, use any non-zero value. The byte value can be 0 to 255.
j0 *value*	Section trace byte (formerly the C1 byte). For interoperability with SDH equipment in Japan, use the value 0x1. The byte value can be 0 to 255.
sls0 *value*	S1 and S0 bits (bits 5 and 6 of the H1 #1 payload pointer byte). Use the following values to tell the SONET transmission equipment the SS bit: • For OC-3c, use 0 (this is the default). • For AU-4 container in SDH, use 2. The S1 and S0 bits can be 0 to 3. Values 1 and 3 are undefined.

Default

The default **c2** value is 0xCF, and the default **sls0** value is 0.

Command Mode

Interface configuration

Usage Guidelines

This command was added in Cisco IOS Release 11.2 GS to support the Cisco 12000 series Gigabit Switch Routers.

Example

The following example sets the path signal identifier used to identify the payload content type to ATM on the line card in slot 9:

```
Router(config)# interface pos 9/0
Router(config-if)# pos flag c2 0x13
Router(config-if)# end
Router#
```

pos framing

To specify the framing used on the POS interface, use the **pos framing** interface configuration command. To return to the default SONET STS-3c framing mode, use the **no** form of this command.

pos framing {**sdh** | **sonet**}
no pos framing

Syntax Description

sdh	Selects SDH STM-1 framing. This framing mode is typically used in Europe.
sonet	Selects SONET STS-3c framing. This is the default.

Default

SONET STS-3c framing

Command Mode

Interface configuration

Usage Guidelines

This command was modified in Cisco IOS Release 11.2 GS to change the command syntax from **pos framing-sdh** to **pos framing** and add the **sonet** keyword.

Example

In the following example, the interface is configured for SDH STM-1 framing:

```
Router(config)# interface pos 3/0
Router(config-if)# pos framing sdh
Router(config-if)# no shutdown
Router(config-if)# end
Router#
```

Related Commands

interface pos

pos scramble-atm

To enable SONET payload scrambling on a POS interface, use the **pos scramble-atm** interface command. To disable scrambling, use the **no** form of this command.

pos scramble-atm
no pos scramble-atm

Syntax Description

This command has no keywords or arguments.

Default

Disabled.

Command Mode

Interface configuration

Usage Guidelines

This command was added in Cisco IOS Release 11.2 GS to support the Cisco 12000 series Gigabit Switch Routers.

SONET payload scrambling applies a self-synchronous scrambler (x^43+1) to the Synchronous Payload Envelope (SPE) of the interface to ensure sufficient bit transition density.

Both ends of the connection must use the same scrambling algorithm.

When enabling POS scrambling on a VIP2 POSIP on the Cisco 7500 series that has a hardware revision of 1.5 or higher, you can specify CRC 16 only (that is, CRC 32 is currently not supported). To determine the hardware version of the POSIP, use the **show diag** command. The POS interface on the Cisco 12000 series has no restrictions.

To determine whether scrambling is enabled on the interface, use the **show interface pos** command or **show startup-config** command.

Example

The following example enables scrambling on the interface:

```
Router(config)# interface pos 3/0
Router(config-if)# pos scramble-atm
Router(config-if)# no shutdown
Router(config-if)# end
Router#
```

Related Commands

interface pos
show interface pos

set card-message

To specify the message that is displayed on the LED on the front panel of one or more line cards, use the **set card-message** privileged EXEC command. To remove the message, use the **clear card-message** global command.

set card-message {**all** | **slot** *slot-number*} [**expire** *seconds*] [**blink** *seconds*] *message*

Syntax Description

all	Specifies that the LED message is set on all line cards.
slot *slot-number*	Specifies that the LED message is set on a specific line card. Slot numbers range from 0 to 11 for the Cisco 12012 and 0 to 7 for the Cisco 12008.
expire *seconds*	(Optional) Specifies how long the message is displayed on the front panel LED. The range is 0 to 31536000 seconds. When you select 0, the message remains on the LED until you clear it by using the **clear card-message** command. When the time expires, the user-specified message is removed, and the LED displays the status message based on the line card's last state.
blink *seconds*	(Optional) Specifies how often the message blinks (that is, goes on and off) in seconds. The range is 1 to 10 seconds. If blink is not specified, the message does not blink.
message	Specifies the text to display on the LED on the front panel of one or more line cards. The message can be up to eight alphanumeric characters (four characters per line).

Default

System LED message is displayed.

Command Mode

Privileged EXEC

Usage Guidelines

This command was added in Cisco IOS Release 11.2 GS to support the Cisco 12000 series Gigabit Switch Routers.

The user-specified message is also displayed in the **show diag** command output.

To revert to the normal status message for the line card, use the **clear card-message** global configuration command.

Example

The following example sets the message USER MSG to display on the LED on line card 3. This message blinks every two seconds.

```
Router# set card-message slot 3 blink 2 USER MSG
```

Related Commands

clear card-message
show diag

show context

To display information stored in NVRAM when the router crashes, use the **show context** EXEC command.

show context summary
show context {**all** | **slot** *slot-number* [*crash-index*] [**all**] [**debug**]}

Syntax Description

summary	Displays a summary of all the crashes recorded.
all	Displays all crashes for all the slots. When optionally used with the **slot** keyword, displays crash information for the specified slot.
slot *slot-number* [*crash-index*]	Displays information for a particular line card. Slot numbers range from 0 to 11 for the Cisco 12012 and 0 to 7 for the Cisco 12008. Index number allows you to look at previous crash contexts. Contexts from the last 24 line card crashes are saved on the GRP card. If the GRP reloads, the last 24 line card crash contexts are lost. For example, **show context slot 3 2** shows the second most recent crash for line card in slot 3. Index numbers are displayed by the **show context summary** command
debug	(Optional) Displays crash information as hex record dump in addition to one of the options listed above.

Command Mode

EXEC

Usage Guidelines

This command was modified in Cisco IOS Release 11.2 GS to add the **all**, **debug**, **slot**, and **summary** keywords.

The display from the **show context** command includes the following information:

- Reason for the system reboot
- Stack trace
- Software version
- The signal number, code, and router uptime information
- All the register contents at the time of the crash

Note This information is of use only to technical support representatives in analyzing crashes in the field. It is included here in case you need to read the displayed statistics to an engineer over the phone.

Sample Display

The following is sample output from the **show context** command following a system failure:

```
Router> show context

System was restarted by error - a Software forced crash, PC 0x60189354
GS Software (RSP-PV-M), Experimental Version 11.1(2033) [ganesh 111]
Compiled Mon 31-Mar-97 13:21 by ganesh
Image text-base: 0x60010900, data-base: 0x6073E000
Stack trace from system failure:
FP: 0x60AEA798, RA: 0x60189354
FP: 0x60AEA798, RA: 0x601853CC
FP: 0x60AEA7C0, RA: 0x6015E98C
FP: 0x60AEA7F8, RA: 0x6011AB3C
FP: 0x60AEA828, RA: 0x601706CC
FP: 0x60AEA878, RA: 0x60116340
FP: 0x60AEA890, RA: 0x6011632C
Fault History Buffer:
GS Software (RSP-PV-M), Experimental Version 11.1(2033) [ganesh 111]
Compiled Mon 31-Mar-97 13:21 by ganesh
Signal = 23, Code = 0x24, Uptime 00:04:19
$0 : 00000000, AT : 60930120, v0 : 00000032, v1 : 00000120
a0 : 60170110, a1 : 6097F22C, a2 : 00000000, a3 : 00000000
t0 : 60AE02A0, t1 : 8000FD80, t2 : 34008F00, t3 : FFFF00FF
t4 : 00000083, t5 : 3E840024, t6 : 00000000, t7 : 11010132
s0 : 00000006, s1 : 607A25F8, s2 : 00000001, s3 : 00000000
s4 : 00000000, s5 : 00000000, s6 : 00000000, s7 : 6097F755
t8 : 600FABBC, t9 : 00000000, k0 : 30408401, k1 : 30410000
gp : 608B9860, sp : 60AEA798, s8 : 00000000, ra : 601853CC
EPC : 60189354, SREG : 3400EF03, Cause : 00000024
Router>
```

The following is sample output from the **show context summary** command on a Cisco 12012 router. The **show context summary** command displays a summary of all the crashes recorded.

```
Router# show context summary
CRASH INFO SUMMARY
  Slot 0 : 0 crashes
  Slot 1 : 0 crashes
  Slot 2 : 0 crashes
  Slot 3 : 0 crashes
  Slot 4 : 0 crashes
  Slot 5 : 0 crashes
  Slot 6 : 0 crashes
  Slot 7 : 2 crashes
    1 - crash at 18:06:41 UTC Tue Nov 5 1996
    2 - crash at 12:14:55 UTC Mon Nov 4 1996
  Slot 8 : 0 crashes
  Slot 9 : 0 crashes
  Slot 10: 0 crashes
  Slot 11: 0 crashes
Router#
```

Related Commands

show processes
show stacks

show controllers (GRP image)

To display information that is specific to the hardware, use the **show controllers** privileged EXEC command.

show controllers [**atm** *number* | **clock** | **csar** [**register**] | **csc-fpga** | **dp83800** | **fab-clk** | **fia** [**register**] | **pos** [*number*] [**details**] | **queues** [*slot-number*] | **sca** | **xbar**]

Syntax Description

atm *number*	(Optional) Displays the ATM controllers. Number is slot-number/ port-number (for example, 4/0). Slot numbers range from 0 to 11 for the Cisco 12012 and 0 to 7 for the Cisco 12008.
clock	(Optional) Displays the clock card configuration.
csar [**register**]	(Optional) Displays the Cisco Cell Segmentation and Reassembly (CSAR) information. CSAR is the name of the chip on the card that handles traffic between the GRP and the switch fabric interface ASICs.
csc-fpga	(Optional) Displays the clock and scheduler card register information in the field programmable gate array (FPGA).
dp83800	(Optional) Displays the Ethernet information on the GRP card.
fab-clk	(Optional) Display the switch fabric clock register information. The switch fabric clock FPGA is a chip that monitors the incoming fabric clock generated by the switch fabric. This clock is needed by each card connecting to the switch fabric to properly communicate with it. There are two switch fabric clocks arriving at each card; only one can be used. The FPGA monitors both clocks and selects which one to use if only one of them is running.
fia [**register**]	(Optional) Displays the fabric interface ASIC information and optionally display the register information.
pos [*number*] [**details**]	(Optional) Displays the POS framer state and optionally displays all the details for the interface. Number is slot-number/ port-number (for example, 4/0). Slot numbers range from 0 to 11 for the Cisco 12012 and 0 to 7 for the Cisco 12008.
queues [*slot-number*]	(Optional) Displays the SDRAM buffer carve information and optionally displays the information for a specific line card. The SDRAM buffer carve information displayed is suggested carve information from the GRP card to the line card. Line cards might change the shown percentages based on SDRAM available. Slot numbers range from 0 to 11 for the Cisco 12012 and 0 to 7 for the Cisco 12008.
sca	(Optional) Displays the SCA register information. The SCA is an ASIC that arbitrates among the line cards requests to use the switch fabric.

xbar	(Optional) Displays the crossbar register information. The XBAR is an ASIC that switches the data as it passes through the switch fabric.

Command Mode

Privileged EXEC

Usage Guidelines

This command was added in Cisco IOS Release 11.2 GS to support the Cisco 12000 series Gigabit Switch Routers.

Note This information is of use only to technical support representatives in analyzing system failures in the field. It is included here in case you need to read the displayed statistics to an engineer over the phone.

Sample Display

The following example is sample output from the **show controllers pos** command for a Cisco 12012.

```
Router# show controllers pos 7/0
POS7/0
SECTION
  LOF = 2          LOS = 0                           BIP(B1) = 5889
  Active Alarms: None
LINE
  AIS = 2          RDI = 2          FEBE = 146       BIP(B2) = 2106453
  Active Alarms: None
PATH
  AIS = 2          RDI = 4          FEBE = 63        BIP(B3) = 3216
  LOP = 0          PSE = 8          NSE = 3          NEWPTR = 2
  Active Alarms: None
APS
  COAPS = 3          PSBF = 2
  State: PSBF_state = False
  Rx(K1/K2): F0/15  Tx(K1/K2): 00/00
  S1S0 = 00, C2 = 64
PATH TRACE BUFFER : STABLE
  Remote hostname : GSR-C
  Remote interface: POS10/0
  Remote IP addr  : 10.201.101.2
  Remote Rx(K1/K2): F0/15  Tx(K1/K2): 00/00
Router#
```

Related Commands

clear controllers
show controllers (line card image)

show controllers (line card image)

To display information that is specific to the hardware on a line card, use the **attach** privileged EXEC command to connect to the line card and then use the **show controllers** privileged EXEC command or the **execute-on** privileged EXEC command.

show controllers atm [[*port-number*] [**all** | **sar** | **summary**]]
show controllers fia [**register**]
show controllers {**frfab** | **tofab**} {**bma** {**microcode** | **ms-inst** | **register**} |
    qelem *start-queue-element* [*end-queue-element*] |
    qnum *start-queue-number* [*end-queue-number*] |
    queues | **statistics**}
show controllers io
show controllers l3
show controllers pos {**framers** | **queues** | **registers** |
    rxsram *port-number queue-start-address* [*queue-length*] |
    txsram *port-number queue-start-address* [*queue-length*]}

Syntax Description

atm [[*port-number*] [**all** | **sar** | **summary**]]	Displays the ATM controller information. Optionally displays ATM controllers for a specific line card and lists all details, lists SAR interactive command, or lists SAR status summary.
fia [**register**]	Displays the fabric interface ASIC information and optionally displays the register information.
{**frfab** | **tofab**}	Displays the from fabric (transmit) or to fabric (receive) information.
bma {**microcode** | **ms-inst** | **register**}	For the **frfab** or **tofab** keywords, displays silicon queueing engine (SQE) information for the microcode bundled in the line card and currently running version, the micro sequencer instructions, or the registers. The silicon queueing engine is the same as the BMA.
qelem *start-queue* [*end-queue*]	For the **frfab** or **tofab** keywords, displays the SDRAM buffer pool queue element summary information by specifying the start queue element number (0 to 65535) and optionally the end queue element number (0 to 65535).
qnum *start-queue* [*end-queue*]	For the **frfab** or **tofab** keywords, displays the SDRAM buffer pool queue detail information by specifying the start free queue number (0 to 127) and optionally the end free queue number (0 to 127).
queues	For the **frfab** or **tofab** keywords, displays the SDRAM buffer pool information.
statistics	For the **frfab** or **tofab** keywords, displays the BMA counters.
io	Displays input/output registers.

l3	Displays Layer 3 ASIC information.
pos {**framers** | **queues** | **registers** | **rxsram** *port-number queue-start-address* [*queue-length*] | **txsram** *port-number queue-start-address* [*queue-length*]}	Displays the POS framer registers, queue information, ASIC registers, receive queue SRAM, or transmit queue SRAM information. When you display the transmit or receive queue information, you must specify a port (valid range is 0 to 3) and the queue SRAM logical starting address. You can also optionally specify the queue SRAM length.

Command Mode

Privileged EXEC

Usage Guidelines

This command was added in Cisco IOS Release 11.2 GS to support the Cisco 12000 series Gigabit Switch Routers.

Note This information is of use only to technical support representatives in analyzing crashes in the field. It is included here in case you need to read the displayed statistics to an engineer over the phone.

Sample Displays

Because you are executing this command on the line card, you must use the **execute-on** command to perform the **show** command, or you must connect to the card using the **attach** command. All examples in this section use the **execute-on** command

The following is partial sample output from the **show controllers atm** command.

```
Router# execute-on slot 4 show controllers atm 0
TX SAR (Beta 1.0.0) is Operational;
RX SAR (Beta 1.0.0) is Operational;

Interface Configuration Mode:
        STS-12c

Active Maker Channels: total # 6
VCID  ChnnlID  Type  OutputInfo    InPkts   InOAMs  MacString
   1   0888    UBR    0C010010          0         0  08882000AAAA030000000800
   2   0988    VBR    04010020          0         0  09882000
   3   8BC8    UBR    0C010030          0         0  8BC82000AAAA030000000800
   4   0E08    UBR    0C010040          0         0  0E082000AAAA030000000800
  10   1288    VBR    040100A0          0         0  12882000
  11   8BE8    VBR    0C0100B0          0         0  8BE82000AAAA030000000800

SAR Total Counters:
total_tx_idle_cells 215267  total_tx_paks 0  total_tx_abort_paks 0
total_rx_paks 0  total_rx_drop_paks 0  total_rx_discard_cells 15

Switching Code Counters:
total_rx_crc_err_paks 0  total_rx_giant_paks 0
total_rx_abort_paks 0  total_rx_crc10_cells 0
total_rx_tmout_paks 0  total_rx_unknown_paks 0
total_rx_out_buf_paks 0  total_rx_unknown_vc_paks 0
```

```
BATMAN Asic Register Values:
hi_addr_reg 0x8000, lo_addr_reg 0x000C, boot_msk_addr 0x0780,
rmcell_msk_addr 0x0724, rmcnt__msk_addr 0x07C2, txbuf_msk_addr 0x070C,
...
CM622 SAR Boot Configuration:
txind_q_addr 0x14000 txcmd_q_addr 0x20000
...
SUNI-622 Framer Register Values:
Master Rst and Ident/Load Meters Reg (#0x0): 0x10
Master Configuration Reg (#0x1): 0x1F
Master Interrupt Status Reg (#0x2): 0x00
PISO Interrupt Reg (#0x3): 0x04
Master Auto Alarm Reg (#0x4): 0x03
Master Auto Alarm Reg (#0x5): 0x07
Parallel Output Port Reg (#0x6): 0x02
...
BERM Line BIP Threshold LSB Reg (#0x74): 0x00
BERM Line BIP Threshold MSB Reg (#0x75): 0x00
Router#
```

The following is partial sample output from the **show controllers** command.

```
Router# execute-on slot 6 show controllers
Interface POS0
Hardware is BFLC POS
lcpos_instance struct   60311B40
RX POS ASIC addr space  12000000
TX POS ASIC addr space  12000100
SUNI framer addr space  12000400
SUNI rsop intr status   00
CRC32 enabled, HDLC enc, int clock
no loop

Interface POS1
Hardware is BFLC POS
lcpos_instance struct   603142E0
RX POS ASIC addr space  12000000
TX POS ASIC addr space  12000100
SUNI framer addr space  12000600
SUNI rsop intr status   00
CRC32 enabled, HDLC enc, int clock
no loop
...
Router#
```

The following is partial sample output from the **show controllers pos framers** command.

```
Router# execute-on slot 6 show controllers pos framers
Framer 0, addr=0x12000400:
master reset            C0
master config           1F        rrate sts3c trate sts3c fixptr
master control          00
clock rcv cntrl         D0
RACP control            84
RACP gfc control        0F
TACP control status     04        hcsadd
RACP intr enable        04
RSOP cntrl intr enable  00
RSOP intr status        00
TPOP path sig lbl (c2)  13
SPTB control            04        tnull
SPTB status             00
```

```
Framer 1, addr=0x12000600:
master reset            C0
master config           1F        rrate sts3c trate sts3c fixptr
master control          00
clock rcv cntrl         D0
RACP control            84
RACP gfc control        0F
TACP control status     04        hcsadd
RACP intr enable        04
RSOP cntrl intr enable  00
RSOP intr status        00
TPOP path sig lbl (c2)  13
SPTB control            04        tnull
SPTB status             00

Framer 2, addr=0x12000800:
master reset            C0
master config           1F        rrate sts3c trate sts3c fixptr
master control          00
clock rcv cntrl         D0
RACP control            84
RACP gfc control        0F
TACP control status     04        hcsadd
RACP intr enable        04
RSOP cntrl intr enable  00
RSOP intr status        00
TPOP path sig lbl (c2)  13
SPTB control            04        tnull
SPTB status             00
...
Router#
```

The following is partial sample output from the **show controllers fia** command.

```
Router# execute-on slot 7 show controllers fia
========= Line Card (Slot 7) =======

Fabric configuration: Full bandwidth redundant
Master Scheduler: Slot 17

From Fabric FIA Errors
----------------------
redund fifo parity 0          redund overflow 0          cell drops 0
crc32 lkup parity  0          cell parity     0          crc32      0
          0          1          2          3          4
       --------   --------   --------   --------   --------
los    0          0          0          0          0
crc16  0          0          0          0          0

To Fabric FIA Errors
----------------------
sca not pres 0          req error     0          uni fifo overflow 0
grant parity 0          multi req     0          uni fifo undrflow 0
cntrl parity 0          uni req       0          crc32 lkup parity 0
multi fifo   0          empty dst req 0          handshake error   0
```

Related Commands

clear controllers
show controllers (GRP image)

show diag

To display hardware information including DRAM and SRAM on the line cards, use the **show diag** privileged EXEC command.

show diag [*slot-number*] [**details**] [**summary**]

Syntax Description

slot-number	(Optional) Slot number of the interface.
details	(Optional) Displays more details than the normal **show diag** output.
summary	(Optional) Displays a summary (one line per slot) of the chassis.

Command Mode

Privileged EXEC

Usage Guidelines

This command was modified in Cisco IOS Release 11.2 GS to include sample output from the Cisco 12000 series Gigabit Switch Routers.

Use this command to determine the type of hardware installed in your router.

Sample Display

The following is sample output from the **show diag** command:

```
Router# show diag 3
SLOT 3  (RP/LC 3 ): 4 Port Packet Over SONET OC-3c/STM-1 Multi Mode
  MAIN: type 33,  00-0000-00 rev 70 dev 0
        HW config: 0x01    SW key: 00-00-00
  PCA:  73-2147-02 rev 94 ver 2
        HW version 1.0  S/N 04499695
  MBUS: MBUS Agent (1)  73-2146-05 rev 73 dev 0
        HW version 1.1  S/N 04494882
        Test hist: 0x00    RMA#: 00-00-00    RMA hist: 0x00
  DIAG: Test count: 0x05000001    Test results: 0x00000000
  MBUS Agent Software version 01.27 (RAM) using CAN Bus A
  ROM Monitor version 00.0D
  Fabric Downloader version used 00.0D (ROM version is 00.0D)
  Board is analyzed
  Board State is Line Card Enabled (IOS  RUN )
  Insertion time: 00:00:10 (00:04:51 ago)
  DRAM size: 33554432 bytes
  FrFab SDRAM size: 67108864 bytes
  ToFab SDRAM size: 16777216 bytes
Router#
```

The following is sample output from the **show diag summary** command:

```
Router# show diag summary
SLOT 0  (RP/LC 0 ): Route Processor
SLOT 2  (RP/LC 2 ): 4 Port Packet Over SONET OC-3c/STM-1 Single Mode
SLOT 4  (RP/LC 4 ): 4 Port Packet Over SONET OC-3c/STM-1 Single Mode
SLOT 7  (RP/LC 7 ): 4 Port Packet Over SONET OC-3c/STM-1 Single Mode
SLOT 9  (RP/LC 9 ): 4 Port Packet Over SONET OC-3c/STM-1 Single Mode
SLOT 11 (RP/LC 11): 4 Port Packet Over SONET OC-3c/STM-1 Single Mode
SLOT 16 (CSC 0   ): Clock Scheduler Card
SLOT 17 (CSC 1   ): Clock Scheduler Card
SLOT 18 (SFC 0   ): Switch Fabric Card
SLOT 19 (SFC 1   ): Switch Fabric Card
SLOT 20 (SFC 2   ): Switch Fabric Card
SLOT 24 (PS A1   ): AC Power Supply
SLOT 26 (PS B1   ): AC Power Supply
SLOT 28 (TOP FAN ): Blower Module
SLOT 29 (BOT FAN ): Blower Module
Router#
```

The following is sample output from the **show diag details** command:

```
Router# show diag 4 details
SLOT 4  (RP/LC 4): 4 Port Packet Over SONET OC-3c/STM-1 Single Mode
  MAIN: type 33,  800-2389-01 rev 71 dev 16777215
        HW config: 0x00    SW key: FF-FF-FF
  PCA:  73-2275-03 rev 75 ver 3
        HW version 1.1  S/N 04529465
  MBUS: MBUS Agent (1)  73-2146-06 rev 73 dev 0
        HW version 1.1  S/N 04541395
        Test hist: 0xFF    RMA#: FF-FF-FF    RMA hist: 0xFF
  DIAG: Test count: 0x05000001    Test results: 0x00000000
  EEPROM contents (hex):
  00: 01 00 01 00  49 00 08 62  06 03 00 00  00 FF FF FF
  10: 30 34 35 34  31 33 39 35  FF FF FF FF  FF FF FF FF
  20: 01 01 00 00  00 00 00 FF  FF FF FF FF  FF FF FF FF
  30: A5 FF A5 A5  A5 A5 FF A5  A5 A5 A5 A5  A5 A5 A5 A5
  40: 00 21 01 01  00 49 00 08  E3 03 05 03  00 01 FF FF
  50: 03 20 00 09  55 01 01 FF  FF FF 00 FF  FF FF FF FF
  60: 30 34 35 32  39 34 36 35  FF FF FF FF  FF FF FF FF
  70: FF FF FF FF  FF FF FF FF  05 00 00 01  00 00 00 00
  MBUS Agent Software version 01.24 (RAM)
  Fabric Downloader version 00.0D
  Board is analyzed
  Flags: 0x4
  Board State is Line Card Enabled (IOS  RUN)
  Insertion time: 00:00:10 (00:04:51 ago)
  DRAM size: 33554432 bytes
  FrFab SDRAM size: 67108864 bytes
  ToFab SDRAM size: 16777216 bytes
Router#
```

show environment

To display temperature, voltage, and blower information on the Cisco 12000 series Gigabit Switch Router, use the **show environment** privileged EXEC command.

show environment [**alarms** | **all** | **fans** | **hardware** | **last** | **leds** | **power-supply** | **table** | **temperatures** | **voltages**]

Syntax Description

alarms	(Optional) Displays the alarm contact information.
all	(Optional) Displays a detailed listing of the power supplies, temperature readings, voltage readings, and blower speeds.
fans	(Optional) Displays blower and fan information.
hardware	(Optional) Displays hardware-specific information.
last	(Optional) Displays information on the last measurement made.
leds	(Optional) Displays the status of the MBus LEDs on the clock and scheduler cards and switch fabric cards.
power-supply	(Optional) Displays power supply voltage and current information.
table	(Optional) Displays the temperature, voltage, and blower thresholds.
temperature	(Optional) Displays temperature information.
voltages	(Optional) Displays voltage information.

Default

If no options are specified, the current environmental parameters are displayed.

Command Mode

Privileged EXEC

Usage Guidelines

This command was modified in Cisco IOS Release 11.2 GS to include the **alarms**, **fans**, **hardware**, **leds**, **power-supply**, **temperature**, and **voltages** keywords and to provide sample output for the Cisco 12000 series Gigabit Switch Routers.

Once a minute a routine is run that gets environmental measurements from sensors and stores the output into a buffer. This buffer is displayed on the console when **show environment** is invoked.

If a measurement exceeds desired margins, but has not exceeded fatal margins, a warning message is printed to the system console. The system software queries the sensors for measurements once a minute, but warnings for a given test point are printed at most once every hour for sensor readings in the warning range and once every 5 minutes for sensor readings in the critical range. If a

measurement is out of line within these time segments, an automatic warning message appears on the console. As noted, you can query the environmental status with the **show environment** command at any time to determine whether a measurement is at the warning or critical tolerance.

If a shutdown occurs because of detection of fatal environmental margins, the last measured value from each sensor is stored in internal nonvolatile memory.

For environmental specifications, refer to the hardware installation and configuration publication for your individual chassis.

If the Cisco 12000 series exceeds environmental conditions, a message similar to the one below is displayed on the console:

```
%GSR_ENV-2-WARNING: Slot 3 Hot Sensor Temperature exceeds 40 deg C;
Check cooling systems
```

Note Blower temperatures that exceed environmental conditions do not generate a warning message.

Sample Displays

The following examples are for the Cisco 12000 series Gigabit Switch Routers.

The following is sample output from the **show environment** command for a Cisco 12012. Slots 0 through 11 are the line cards, slots 16 and 17 are the clock and scheduler cards, slots 18 through 20 are the switch fabric cards, slots 24 through 27 are the power supplies, and slots 28 and 29 are the blowers. An “NA” in the table means that no values was returned. In some cases it is because the equipment is not supported for that environmental parameter (for example, the power supply and blowers in slots 24, 26, 28, and 29 do not have a 3V power supply so an NA is displayed).

```
Router# show environment
Slot #  3V      5V      MBUS 5V Hot Sensor      Inlet Sensor
        (mv)    (mv)    (mv)     (deg C)          (deg C)
0       3300    4992    5040       42.0            37.0
2       3296    4976    5136       40.0            33.0
4       3280    4992    5120       38.5            31.5
7       3280    4984    5136       42.0            32.0
9       3292    4968    5160       39.5            31.5
11      3288    4992    5152       40.0            30.5
16      3308    NA      5056       42.5            38.0
17      3292    NA      5056       40.5            36.5
18      3304    NA      5176       36.5            35.0
19      3300    NA      5184       37.5            33.5
20      3304    NA      5168       36.5            34.0
24      NA      5536    5120       NA              31.5
26      NA      5544    5128       NA              31.5
28      NA      NA      5128       NA              NA
29      NA      NA      5104       NA              NA

Slot #  48V     AMP_48
        (Volt)  (Amp)
24      46      12
26      46      19

Slot #  Fan 0   Fan 1   Fan 2
        (RPM)   (RPM)   (RPM)
28      2160    2190    2160
29      2130    2190    2070
Router#
```

Table 3 describes the fields shown in the output and lists the equipment that is supported by each environmental parameter. If an "NA" is listed in the field and the equipment is supported, it means that the reading could not be obtained. Try the command again.

Table 3 Show Environment Field Descriptions

Field	Description
Slot #	Slot number of the equipment. On the Cisco 12012, slots 0 through 11 are the line cards, slots 16 and 17 are the clock and scheduler cards, slots 18 through 20 are the switch fabric cards, slots 24 through 27 are the power supplies, and slots 28 and 29 are the blowers.
3V (mv)	Measures the 3-volt power supply on the card. The 3-volt power supply is on the line cards, GRP card, clock and scheduler cards, and switch fabric cards.
5V (mv)	Measures the 5-volt power supply on the card. The 5-volt power supply is on the line cards, GRP card, and power supplies.
MBUS 5V (mv)	Measures the 5-volt MBus on the card. The 5-volt MBus is on all equipment.
Hot Sensor (deg C)	Measures the temperature at the hot sensor on the card. The hot sensor is on the line cards, GRP card, clock and scheduler cards, switch fabric cards, and blowers.
Inlet Sensor (deg C)	Measures the current inlet temperature on the card. The inlet sensor is on the line cards, GRP card, clock and scheduler cards, switch fabric cards, and power supplies.
48V (Volt)	Measures the DC power supplies.
AMP_48 (Amp)	Measures the AC power supplies.
Fan 0, Fan 1, Fan 2	Measures the fan speed in rotations per minute.

The following is sample output from the **show environment all** command for the Cisco 12008. Slots 0 through 7 are the line cards, slots 16 and 17 are the clock scheduler cards (the clock scheduler cards control the fans), slots 18 through 20 are the switch fabric cards, and slots 24 and 26 are the power supplies. The Cisco 12008 does not support slots 25, 27, 28, and 29. An "NA" in the table means that no values was returned. In some cases it is because the equipment is not supported for that environmental parameter (for example, the power supplies in slots 24 and 26 do not have a hot sensor, so an NA is displayed).

```
Router# show environment all
Slot #  Hot Sensor      Inlet Sensor
         (deg C)          (deg C)
2          31.0            22.0
5          33.5            26.5
16         25.5            21.5
18         22.0            21.0
19         22.5            21.0
24         NA              29.5
26         NA              24.5

Slot #  3V      5V      MBUS 5V
        (mv)    (mv)    (mv)
2       3292    5008    5136
5       3292    5000    5128
16      3272    NA      5128
18      3300    NA      5128
19      3316    NA      5128
```

```
Slot #  5V      MBUS 5V 48V     AMP_48
        (mv)    (mv)    (Volt)  (Amp)
24      0       5096    3       0
26      5544    5144    47      3

Slot #  Fan Information
16      Voltage 16V Speed slow: Main Fans Ok Power Supply fans Ok

Alarm Indicators
No alarms

Slot #  Card Specific Leds
16      Mbus OK SFCs Failed
18      Mbus OK
19      Mbus OK
24      Input Failed
26      Input Ok
```

The following is sample output from the **show environment table** command for a Cisco 12012. The **show environment table** command lists the warning, critical, and shutdown limits on your system and includes the GRP card and line cards (slots 0-15), clock and scheduler cards (slots 16-17), switch fabric cards (slots 18-20), and blowers.

```
Router# show environment table

Hot Sensor Temperature Limits (deg C):
                        Warning Critical Shutdown
GRP/GLC (Slots 0-15)       40      46      57
CSC     (Slots 16-17)      46      51      65
SFC     (Slots 18-20)      41      46      60

Inlet Sensor Temperature Limits (deg C):
                        Warning Critical Shutdown
GRP/GLC (Slots 0-15)       35      40      52
CSC     (Slots 16-17)      40      45      59
SFC     (Slots 18-20)      37      42      54

3V Ranges (mv):
                           Warning         Critical        Shutdown
                        Below   Above    Below  Above    Below  Above
GRP/GLC (Slots 0-15)     3200    3400     3100   3500     3050   3550
CSC     (Slots 16-17)    3200    3400     3100   3500     3050   3550
SFC     (Slots 18-20)    3200    3400     3100   3500     3050   3550

5V Ranges (mv):
                           Warning         Critical        Shutdown
                        Below   Above    Below  Above    Below  Above
GRP/GLC (Slots 0-15)     4850    5150     4750   5250     4680   5320

MBUS_5V Ranges (mv):
                           Warning         Critical        Shutdown
                        Below   Above    Below  Above    Below  Above
GRP/GLC (Slots 0-15)     5000    5250     4900   5350     4750   5450
CSC     (Slots 16-17)    4820    5150     4720   5250     4750   5450
SFC     (Slots 17-20)    5000    5250     4900   5350     4750   5450

Blower Operational Range (RPM):

Top Blower:
                Warning    Critical
                 Below      Below
Fan 0           1000        750
Fan 1           1000        750
Fan 2           1000        750
```

```
Bottom Blower:
                Warning    Critical
                 Below      Below
Fan 0           1000        750
Fan 1           1000        750
Fan 2           1000        750
```

The following is sample output from the **show environment leds** command for a Cisco 12012. The **show environment leds** command lists the status of the MBus LEDs on the clock and scheduler cards and switch fabric cards.

```
Router# show environment leds
16 leds Mbus OK
18 leds Mbus OK
19 leds Mbus OK
20 leds Mbus OK
```

show gsr

To display hardware information on the Cisco 12000 series Gigabit Switch Routers (GSR), use the **show gsr** EXEC command.

show gsr [**chassis-info** [**details**]]

Syntax Description

chassis-info	(Optional) Displays backplane NVRAM information.
details	(Optional) In addition to the information displayed, this option includes hexadecimal output of the backplane NVRAM information.

Command Mode

EXEC

Usage Guidelines

This command was added in Cisco IOS Release 11.2 GS to support the Cisco 12000 series Gigabit Switch Routers.

Use this command to determine the type of hardware installed in your router.

Sample Displays

The following is sample output from the **show gsr** command for a Cisco 12012. This command shows the type of card installed in the slot and the state of the card.

```
Router# show gsr
Slot 0  type  = Route Processor
        state = IOS Running  MASTER
Slot 7  type  = 1 Port Packet Over SONET OC-12c/STM-4c
        state = Card Powered
Slot 16 type  = Clock Scheduler Card
        state = Card Powered  PRIMARY CLOCK
```

The following is sample output from the **show gsr chassis-info** command for a Cisco 12012:

```
Router# show gsr chassis-info
Backplane NVRAM [version 0x20] Contents -
  Chassis: type 12012 Fab Ver: 1
    Chassis S/N: ZQ24CS3WT86MGVHL
  PCA: 800-3015-1  rev: A0  dev: 257  HW ver: 1.0
    Backplane S/N: A109EXPR75FUNYJK
  MAC Addr: base 0000.EAB2.34FF  block size: 1024
  RMA Number: 0x5F-0x2D-0x44  code: 0x01  hist: 0x1A
```

show logging

To display the state of logging (syslog), use the **show logging** privileged EXEC command.

show logging [**history** | **slot** *slot-number* | **summary**]

Syntax Description

history	(Optional) Displays information in the syslog history table only.
slot *slot-number*	(Optional) Displays information in the syslog history table for a specific line card. Slot numbers range from 0 to 11 for the Cisco 12012 and 0 to 7 for the Cisco 12008.
summary	(Optional) Displays counts of messages by type for each line card.

Command Mode

Privileged EXEC

Usage Guidelines

This command was modified in Cisco IOS Release 11.2 GS to add the **slot** and **summary** keywords.

This command displays the state of syslog error and event logging, including host addresses, and whether console logging is enabled. This command also displays Simple Network Management Protocol (SNMP) configuration parameters and protocol activity.

When you use the optional **history** keyword, information about the syslog history table is displayed such as the table size, the status of messages, and text of messages stored in the table. Messages stored in the table are governed by the **logging history** global configuration command.

Sample Displays

The following is sample output from the **show logging** command:

```
Router# show logging

Syslog logging: enabled
     Console logging: disabled
     Monitor logging: level debugging, 266 messages logged.
     Trap logging: level informational, 266 messages logged.
     Logging to 192.180.2.238

SNMP logging: disabled, retransmission after 30 seconds
    0 messages logged
Router#
```

Table 4 describes significant fields shown in the display.

Table 4 Show Logging Field Descriptions

Field	Description
Syslog logging	When enabled, system logging messages are sent to a UNIX host that acts as a syslog server; that is, it captures and saves the messages.
Console logging	If enabled, states the level; otherwise, this field displays disabled.
Monitor logging	Minimum level of severity required for a log message to be sent to a monitor terminal (not the console).
Trap logging	Minimum level of severity required for a log message to be sent to a syslog server.
SNMP logging	Shows whether SNMP logging is enabled and the number of messages logged, and the retransmission interval.

The following is sample output from the **show logging history** command:

```
Router# show logging history

Syslog History Table: 1 maximum table entry, saving level notifications or higher
0 messages ignored, 0 dropped, 15 table entries flushed,
SNMP notifications not enabled
  entry number 16: SYS-5-CONFIG_I
  Configured from console by console
  timestamp: 1110
Router#
```

Table 5 describes the significant fields shown in the display.

Table 5 Show Logging History Field Descriptions

Field	Description
maximum table entry	Number of messages that can be stored in the history table. Set with the **logging history size** command.
saving level notifications or higher	Level of messages that are stored in the history table and sent to the SNMP server (if SNMP notification is enabled). Set with the **logging history** command.
messages ignored	Number of messages not stored in the history table because the severity level is greater than that specified with the **logging history** command.
dropped	Number of messages that could not be processed due to lack of system resources. Dropped messages do not appear in the history table and are not sent to the SNMP server.
table entries flushed	Number of messages that have been removed from the history table to make room for newer messages.
SNMP notifications	Whether syslog traps of the appropriate level are sent to the SNMP server. Syslog traps are either enabled or not enabled through the **snmp-server enable** command.
entry number	Number of the message entry in the history table.
SYS-5-CONFIG_I Configured from console by console	Cisco IOS syslog message consisting of the facility name (SYS) which indicates where the message came from, the severity level (5), the message name (CONFIG_I), and the message text.
timestamp	Time, based on the router's up time, that the message was generated.

The following is sample output from the **show logging summary** command for the Cisco 12012. A number in the column indicates that the syslog contains that many messages for the line card. For example, line card in slot 9 has 1 error message, 4 warning messages, and 47 notification messages.

```
Router# show logging summary

+-----+-------+-------+-------+-------+-------+-------+-------+-------+
 SLOT | EMERG | ALERT | CRIT  | ERROR |WARNING| NOTICE| INFO  | DEBUG |
+-----+-------+-------+-------+-------+-------+-------+-------+-------+
|* 0* |     . |     . |     . |     . |     . |     . |     . |     . |
|  1  |       |       |       |       |       |       |       |       |
|  2  |       |       |       |     1 |     4 |    45 |       |       |
|  3  |       |       |       |       |       |       |       |       |
|  4  |       |       |       |     5 |     4 |    54 |       |       |
|  5  |       |       |       |       |       |       |       |       |
|  6  |       |       |       |       |       |       |       |       |
|  7  |       |       |       |    17 |     4 |    48 |       |       |
|  8  |       |       |       |       |       |       |       |       |
|  9  |       |       |       |     1 |     4 |    47 |       |       |
| 10  |       |       |       |       |       |       |       |       |
| 11  |       |       |       |    12 |     4 |    65 |       |       |
+-----+-------+-------+-------+-------+-------+-------+-------+-------+
Router#
```

Table 6 describes the logging level fields shown in the display.

Table 6 Show Logging Summary Field Descriptions

Field	Description
SLOT	Indicates the slot number of the line card. An asterisk next to the slot number indicates that this is the GRP card and error message counts are not displayed for the GRP card. For information on the GRP card, use the **show logging** command.
EMERG	Indicates the system is unusable.
ALERT	Indicates immediate action is needed.
CRIT	Indicates a critical condition.
ERROR	Indicates an error condition.
WARNING	Indicates a warning condition.
NOTIFICE	Indicates a normal but significant condition.
INFO	Indicates an informational message only.
DEBUG	Indicates a debugging message.

Related Commands

clear logging
logging history size
logging linecard

Debug Commands

This section documents the following new debug commands. All other debug commands used with this feature are documented in the Cisco IOS Release 11.2 Debug Command Reference.

- **debug gsr mbus**
- **debug ipc errors**
- **debug mbus system**

debug gsr mbus

To enable the display of MBus messages if a line card fails to come up properly, use the **debug gsr mbus** EXEC command. Use the **no** form of the command to disable debugging output.

[**no**] **debug gsr mbus**

Usage Guidelines

This command first appeared in Cisco IOS Release 11.2 GS.

Use the the **debug gsr mbus** command if the line card fails to come up (that is, does not reach the "Line Card Enabled" state when using the **show gsr** command). Reload the line card and review the output that provides a chronology of the boot process. If a lot of MBus errors are being generated, enable the **debug gsr mbus** command. Additional information can be obtained with the **show mbus counters** and **show mbus can-error** commands.

Sample Display

Figure 1 shows sample output from the **debug gsr mbus** command when microcode is reloaded on the line card in slot 4.

Figure 1 Sample Debug GSR MBus Output

```
router# debug gsr mbus
Removed slot 4 for config
Enabling line card 242 on fabric
Added slot 4 for config
Enabling line card 252 on fabric
Launching fab down loader in slot 4
with Switch Cards 1F and
primary_clk CSC_1
Removed slot 4 for config
Enabling line card 242 on fabric
REQ_CONFIG_FIA from slot = 4
config send: code 3 primary 2 switch 1F csc_mode 2
CONFIG_FIA_OVER from slot 4
Added slot 4 for config
Enabling line card 252 on fabric
```

Table 7 describes the messages generated by this command in the sample output.

Table 7 Debug GSR MBus Message Descriptions

Message	Description
Removed slot 4 for config Enabling line card 242 on fabric	Disabling slot 4 on the switching fabric.
Added slot 4 for config Enabling line card 252 on fabric	Enabling slot 4 on the switching fabric.
Launching fab down loader in slot 4 with Switch Cards 1F and primary_clk CSC_1	Launching switching fabric downloader with switch cards 0x1F (all switch fabric cards) with CSC_1 as primary clock.
Removed slot 4 for config Enabling line card 242 on fabric	Disabling slot 4 on the switching fabric.
REQ_CONFIG_FIA from slot = 4 config send: code 3 primary 2 switch 1F csc_mode 2 CONFIG_FIA_OVER from slot 4	Configuring the FIA in slot 4.
Added slot 4 for config Enabling line card 252 on fabric	Enabling slot 4 on the switching fabric.

debug ipc errors

To enable warnings and errors from the Interprocess Communications (IPC) on the line card or Gigabit Route Processor (GRP), use the **debug ipc errors** EXEC command. Use the **no** form of the command to disable debugging output.

[**no**] **debug ipc errors**

Usage Guidelines

This command first appeared in Cisco IOS Release 11.2 GS.

Use the **debug ipc errors** command if you observe IPC error messages or IPC timeout messages and the error counters are increasing when you use the **show ipc statistics** command.

Caution On the GRP, if there are a lot of IPC timeout error messages or messages such as *Unicast send timeout*, verify other statistics with the **show controller csar** and **show controller fia** command to further diagnose the problem before enabling the **debug ipc errors** command.

To use the **debug ipc errors** on a line card, use the **if-con** *slot-number* or **exec slot** *slot-number* command. It is safer to use the **if-con** command rather than the **exec slot** command to enable the **debug ipc errors** command on a line card. If there are IPC problems between the GRP and the line card, the **exec slot** command might fail or wait a long time for the line card to respond.

Caution On the line card, before enabling the **debug ipc errors** command, use the **show ip statistics** command. If the error counters in the **show ipc statistics** command increase at a fast rate, enabling the **debug ipc errors** command might generate a lot of output. Too many log messages from the line card might cause the messages to get dropped over the MBus. In this case, it might be useful to use the **show controller frfab queues** command and check whether the number of elements in the non-IPC free queues or IPC queue is zero. If the number of elements in the non-IPC free queues or IPC queue is zero, it could indicate that the buffers are exhausted.

Sample Display

Figure 2 shows sample output from the **debug ipc errors** command.

Figure 2 Sample Debug IPC Errors Output

```
router# debug ipc errors
IPC: Failed opening master port
```

Table 8 lists the possible messages that could be generated by this command.

Table 8 Debug IPC Errors Message Descriptions

Message	Description
IPC: Couldn't get cached message block	There was no message in the IPC message cache.
IPC: Open port error, port not there	Cannot find the IPC port while trying to initialize it.
IPC: Open port error, no more room on port	The maximum number of IPC ports have been opened.
IPC: Failed opening master port	While trying to locate an IPC port from the master IPC port, the software could not open the master port.
IPC: Could not find seat	Output seat of an IPC port is not present.
IPC: Open port unknown_transport port	Transport should be either reliable, unreliable, or unreliable with notification.
IPC: No memory for close port request	Cannot allocate an IPC message to send a close port request message.
IPC: Cannot open control port 0x0004000 IPC Master:Init (timeout)	Reason for the problem: timeout. Port id: 0x0040000. You can verify the port ID with the **show ipc ports** command. Port name: IPC Master: Init. You can verify the port name with the **show ipc ports** command.
IPC: No memory for remove port request	Cannot allocate an IPC message to send a remove port request message.
IPC: Can't remove port 0x00009000 (timeout)	Cause of the problem: timeout. Port id: 0x00009000. You can verify the port ID with the **show ipc ports** command.
Failed to allocate msg for RTTY response	Cannot allocate an IPC message to send a remote TTY response.
Err opening RTTY server port	Remote TTY client cannot open the RTTY server port.
Not attached to RTTY server port	Remote TTY client is not attached to server to handle response message.
Cannot get buffer for detach response msg	Remote TTY client cannot get IPC message to send detach response.
No server port to detach	Remote TTY client cannot handle detach message as it is not attached to RTTY server.
Cannot register RTTY client IPC port	Remote TTY client cannot register port with IPC.
Cannot write to NULL RTTY server port	RTTY server port no longer exists while RTTY client is sending data.
Cannot write to closed RTTY server port	RTTY server port is closed while RTTY client is sending data.
Cannot get buffer to write RTTYC data	Remote TTY client cannot allocate IPC message to send data to RTTY server.
Cannot output to Null RTTY server	Remote TTY server port is removed while RTTY client is sending output to it.
Err in output to closed RTTY server port	Remote TTY server port is closed while RTTY client is sending output to it.
Err in sending RPC msg to RTTY server	IPC RPC error while sending a message from RTTY client to RTTY server.

Table 8 Debug IPC Errors Message Descriptions (Continued)

Message	Description
Malloc failed for RTTY server port	Memory problems while allocating server port information in RTTY client.
Failed to open RTTY server port	RTTY client cannot open IPC port to RTTY server.
Cannot allocate TTY	RTTY client cannot allocate TTY to communicate with RTTY server.
Failed to duplicate server name	RTTY client cannot copy server port name during initialization.
Cannot get buffer for output rsp msg	RTTY server cannot allocate IPC message for response message.
Cannot register port	RTTY server cannot register its IPC port.
Failed to alloc server port name	RTTY server cannot copy server port name during initialization.
Failed to create server port	RTTY server cannot create IPC port.
IPC: Invalid message received from GRP 7	Line card error message for IPC message from GRP. The message type is 7.
IPC: Init failed due to null IPC globals	Line card initialization failed due to IPC globals failure.
Cannot create named IPC Master:Init port	GRP cannot create port. Port name: IPC Master: Init. You can verify the port name with the **show ipc ports** command.
IPC: Invalid message received from master 0200	Slave GRP initialization failure because of invalid message from master GRP. The message type is 0200.
Seat exists already (IPC Master:Init, 09000200)	GRP cannot initialize slot as the seat already exists. Seat name: IPC Master: Init. You can verify the seat name with the **show ipc nodes** command. The seat id is 09000200.

debug mbus system

To enable the display of low-level mbus messages, use the **debug mbus system** EXEC command. Use the **no** form of the command to disable debugging output.

[**no**] **debug mbus system**

Usage Guidelines

This command first appeared in Cisco IOS Release 11.2 GS.

The **debug mbus system** command is useful for low-level debug of the MBus system.

Enable the **debug mbus system** command if you are getting a lot of MBus errors. Additional information can be obtained with the **show mbus counters** and **show mbus can-error** commands.

Enabling the **debug mbus system** command typically displays the CAN message that generated the error condition. The **debug mbus system** is usually restricted to developers. MBus errors typically manifest as errors in the applications running over the MBus. You can enable debug for that particular application to get more information (for example, **debug gsr mbus** is one such application debug).

Sample Display

Figure 3 shows sample output from the **debug mbus system** command. In this example, the first packet of a new message was received from a selected slot/stream combination while there was already a message in progress. The previous message remains incomplete and is dropped. The MBus system software allows only one message to be sent from a particular slot/stream combination at any given instant.

Figure 3 Sample Debug MBus System Output

```
router# debug mbus system
Reassembly error; incomplete message:
C8 02  80  01 11 08 01 00 01 00 00 00
```